Empowering next generation learners: Wiki / IBL?

Conference strand
Learning and teaching with ICT

Empowering next generation learners: Wiki supported Inquiry Based Learning?

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Plan

- Context
  - Research context
  - Teaching context

- Design
  - Conjectures

- Methods

- Selected findings

- A few trade-offs

- Some design variables

- A lot of discussion
Research context

- Biologist.
- IT in-service education
- Lecturer: ICT integration, educational sciences UniGE
- Thesis research in Educational sciences:
  - Biology evolution / IT-Rich biology teaching
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Teaching context

- Biology high school
- Geneva public schools
- Students 16-19 yrs
- Minor / Major
- Usual context, exams, etc
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Science is a way of building knowledge

(Bio)sciences defining characteristics are:

1. that all knowledge is related to observation or experiment,
2. a family of methods and disciplines grouped around the investigation of life processes and the interrelationships of living organisms
3. they exist in an environment of current hypotheses rather than certainty
4. they include disciplines in which rapid change is happening
5. they are essentially practical and experimental subjects


How does it work?
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IT and biology learning

Biology is undergoing a paradigm change

- IT-Rich Biology 4 aspects identified
  - Bioinformatics
  - GIS and other databases
  - Systems Biology and Simulations
  - Information access-management / information overload

IT-induced change of science ≠ didactic use of IT for teaching science
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Objectives

Learning Objectives
- Std or better achievement at exams.
- Better *scientific thinking* ≠ science of conclusions
- Autonomy in learning: empower students

Research objectives
- Develop a teaching design for IT-rich Biology
- Literature, experience -> design rules
  - Embed conjectures, test
  - Refine design rules
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IBL design

- Elicit questions
- Experiment, observe, read.
- Compose Q & A
- Present / Discuss
- Reframe

The crucial difference between current formulations of inquiry and the traditional "scientific method" is the explicit recognition that inquiry is cyclic and nonlinear.»

Sandoval 2004p. 216
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Conjectures 1/5

- Student activity, meaningful inquiry
  - (De Vecchi, 2006; Giordan, 1998).
- ->deep understanding.
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Conjectures 2/5

- Iteratively writing a significant document (W2L)
  - (Scardamalia, 2004)
  - Writing > print to computer
- \(\rightarrow\) writing (wiki) to build Knowledge in infodense environments
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**Conjectures 3/5**

- Shared writing space (wiki): idea confrontation
  - (Socio-cognitive conflict (Astolfi & Develay, 2002; David Hammer, 1996; Joshua & Dupin, 1993; W. A. Sandoval, 2003))
  - -> In-depth understanding, work on preconceptions
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Conjectures 4/5

- Presenting current knowledge @ early stages
  - (Sandoval 2004)
  - -> favor synthesis, interconnections
  - -> learn to work with ideas "in an environment of current hypotheses rather than certainty".
Conjectures 5/5

- Teacher as tutor; knowledge authority found in experiment or resources.
  - (William A. Sandoval & Daniszewski, 2004)
    - -> develop scientific knowledge building, i.e."that all knowledge is related to observation or experiment".
    - -> validate ideas by their ability to explain data or stand up to criticism
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Methods

- Design Based Research (DBR)
  - Global: *design* is the object.
  - Iterative design cycles.
  - Ethical: best design offered
  - Conjectures embedded tested, towards design rules
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Data

- Data sources
  - Wiki Data: all versions of text is recorded
  - Questionnaires
  - In-training teachers records
- Stratigraphic analysis
- Yearlong analysis
- Longitudinal analysis.
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Results: stratigraphic

Example: immunology

2 hours: 4 students new subject

- Question driven Inquiry
- Autonomy

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Results: stratigraphic

- Example: immunology
- Mechanism questions
- Infodense management
- Question driven Inquiry
- Autonomy

3-4 weeks: 4 students 2 IBL cycles
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End of year questionnaires (link)

Students perceived

- Efficient learning method,
  - structuring, challenging, adequate to prepare for uni
- Autonomy, responsibility: pride.
- Mature view of resources,
  - defiant of affirmative « scientifically proven » info.
- Aware of power of writing to structure, build K.
- Aware of k. assessing potential of presentations
- Cooperation: Mixed feelings
- Workload!
En fait, (cette méthode) est proche de l'histoire de l'homme et du poisson. Si tu donnes un poisson un jour à une personne, il pourra manger qu'une fois alors que si tu lui apprends à pêcher... Personnellement, au collège, je préfère avoir notre poisson quotidien.
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Results

- Student feed-back afterwards ([link](#))
- j'ai commencé l'université de St Gall ce semestre et la méthode wiki est déjà très utile pour 4 grandes raisons:
  - 1° chaque matière nous devons travailler en groupe.
  - 2° La deuxième LWA qui nous apprend à travailler et apprendre de manière scientifique. La méthode wiki va exactement dans ce raisonnement soit de reduire au maximum l'apprentissage passif.
  - 3° travail / 2 mois. Ainsi, de savoir rapidement structurer un travail et savoir comment faire des recherches = atout
  - 4° j'écris des questions bien précises -> étudiants plus avancés dans le bachelor / programme de coaching.
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Some design rules 1

- Matrioschka Russian doll model

Select, choose Wade infodense

Questions

Meaningful Document

Design

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Some design rules 2

- Embedding structuring control into the design
  - Empowers students.
  - Frees the teacher for high level interaction
- -> Formalizing design gives more freedom?
  - Example: define structure of document, of presentation, time control
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Some design rules

- Learn students strategies to manage complex information rather than popularize
- Structuring strategy: IBL
- T -> Coachindexing role:
  - Question eliciting resources / activities.
  - Answer-finding resources / activities.
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Trade-offs

- Formal mastery of domain vs. developing student's ideas
- Document quality vs. quality of the learning supported by this document.
- Accessible, easy to understand resources vs. authentic resources.
- Popularizing science vs. empowering students to face complex information.
- Teacher authority vs. student empowerment.
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A few variables

- Document status re. student goal?
- Effective role of questions?
- Document ownership?
- Teacher’s perception of profession
  - Control?
  - Knowledge distribution
  - Scientific competence
  - …
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Conclusions

- Evidence suggests
- Effective design for building knowledge in infodense resources
- Design might empowers students: knowledge building
  - "No longer is information itself power; rather, power is gained from the ability to access the right information quickly." (NSF 2006)
  - And publish in relevant context.
- Design could develop better NOS.
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Questions -> discussion

- Science, school & uncertainty?
- Complexity / Pygmalion effect?
- Focus on student production?
- Teacher authority vs learners trust -> valid reference to learn from / with
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Refs 1/4

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Refs 2/4

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